

NOTES AND COMMENTS



COLOSS Working Group 1 : monitoring and diagnosis

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Currently, declines in honey bee (*Apis mellifera* L.) populations are being observed in many regions of the world. In the light of this worrying situation, there is an urgent need for scientific investigation. This has led to the formation of an international COST network. This network, COLOSS (prevention of honey bee COLony LOSSes), includes 151 scientists from 39 countries who are collaborating to mitigate the detrimental impact of honey bee colony losses for beekeepers, agriculture and natural biodiversity. COLOSS will identify the factors at the individual honey bee and colony levels that cause severe colony losses and investigate synergistic effects between them. This will enable the development and dissemination of emergency measures and sustainable management strategies to prevent large scale losses in the future. Within the COLOSS network there are four working groups, each tasked with investigating different aspects of colony losses. As with any scientific investigation, a full evaluation of the current situation is required, and little information is available on the quantification the honey bee mortality rates. Moreover, the protocols used to obtain data on honey bee mortality rates and colony collapse vary from country to country. This makes direct comparison of the results difficult, and it is therefore impossible to ascertain whether the situation is the same everywhere. Indeed, some scientists or beekeepers are calling their situation "Colony Collapse Disorder" (CCD) (i.e. in the USA; vanEngelsdorp *et al.*, 2007) and others "Dépérissement" (i.e. in France and Belgium; Haubruge *et al.*, 2006). To meet this problem, the focus of Working Group 1 is to develop a standardised monitoring protocol which could be used by the 39 countries

participating in the COLOSS project. It has been proposed to divide the monitoring into four levels. The first level will achieve quantification of the mortality; the second and the third levels, respectively, will seek to compare colony loss data in the different regions and countries and also the identification of the causative factors. The final level will develop a system for the prediction of potential honey bee colony losses. The first level is the least complex whilst the fourth is the most complex. The data obtained by Levels 1, 2 and 3 will be collected in totality, or in part, by standardized questionnaires. The questionnaire for each level will be designed to allow objectives of the lower level questionnaires to be answered. The data collected at Level 4 will be the result of an epidemiological analysis of the results gathered from the first three levels.

Bee monitoring questionnaire Level 1: surveillance and mortality quantification

Collecting accurate and comparable basic data on honey bee colony losses at a global scale is time consuming, expensive and complicated, since an infrastructure is often absent and financial sources are minimal. For many surveys it is obvious that coverage is inadequate and the concepts behind the questionnaires unclear. Data obtained may therefore not be truly representative of national colony loss status. Within COLOSS a process has been initiated to improve the actual situation by: 1. developing and implementing a standardized basic questionnaire to be used in the participating COLOSS countries;

2. stimulating the development of an infrastructure to obtain good quality survey results; and 3. integrating the observed data in such a way that geographical information can be used for meaningful analyses.

Bee monitoring questionnaire Level 2: apiary comparison

If the mortality quantification (Level 1) shows any signs of increased mortality, then it is relevant to move to the second level of bee monitoring. The aim of the Level 2 questionnaire is to collect additional apiary information (microclimate, colony development, etc.) and to collect relevant data in order to compare the situation between different areas in a country and between different countries. With this questionnaire, the main symptoms in each country will be collected (i.e. empty hive or not, presence of food or not, etc.). It is a more complex, but still basic questionnaire compared to Level 1. Beekeepers should be able to fill out this questionnaire on their own. If necessary, a follow up visit by an extension officer could be undertaken to clarify any outstanding or additional questions.

Bee monitoring questionnaire Level 3: identification of causes

The most important question when beekeepers have observed heavy mortality in their apiaries is: "what has killed my honey bees?" The aim of the bee monitoring Level 3 is to try to answer this question. This questionnaire will be more complex than the preceding two. It will include specific symptoms, or symptoms related to a few potential causes. Beforehand, a bibliographic study should be conducted on the different factors that could have an impact on honey bee vitality (Fig. 1). All the relevant symptoms in relation to these factors will be provided as survey tools to measure the results of a questionnaire on these symptoms. A complementary analysis will be molecular, microscopic or microbiological. The questionnaire will not be completed by the beekeeper alone; the help of a specialist will be needed to complete the form. In addition to the completion of the questionnaire, the affected apiaries should also be visited and samples collected. The optimisation and standardisation of diagnostic methods for potential causative factors must be also achieved. To ensure that

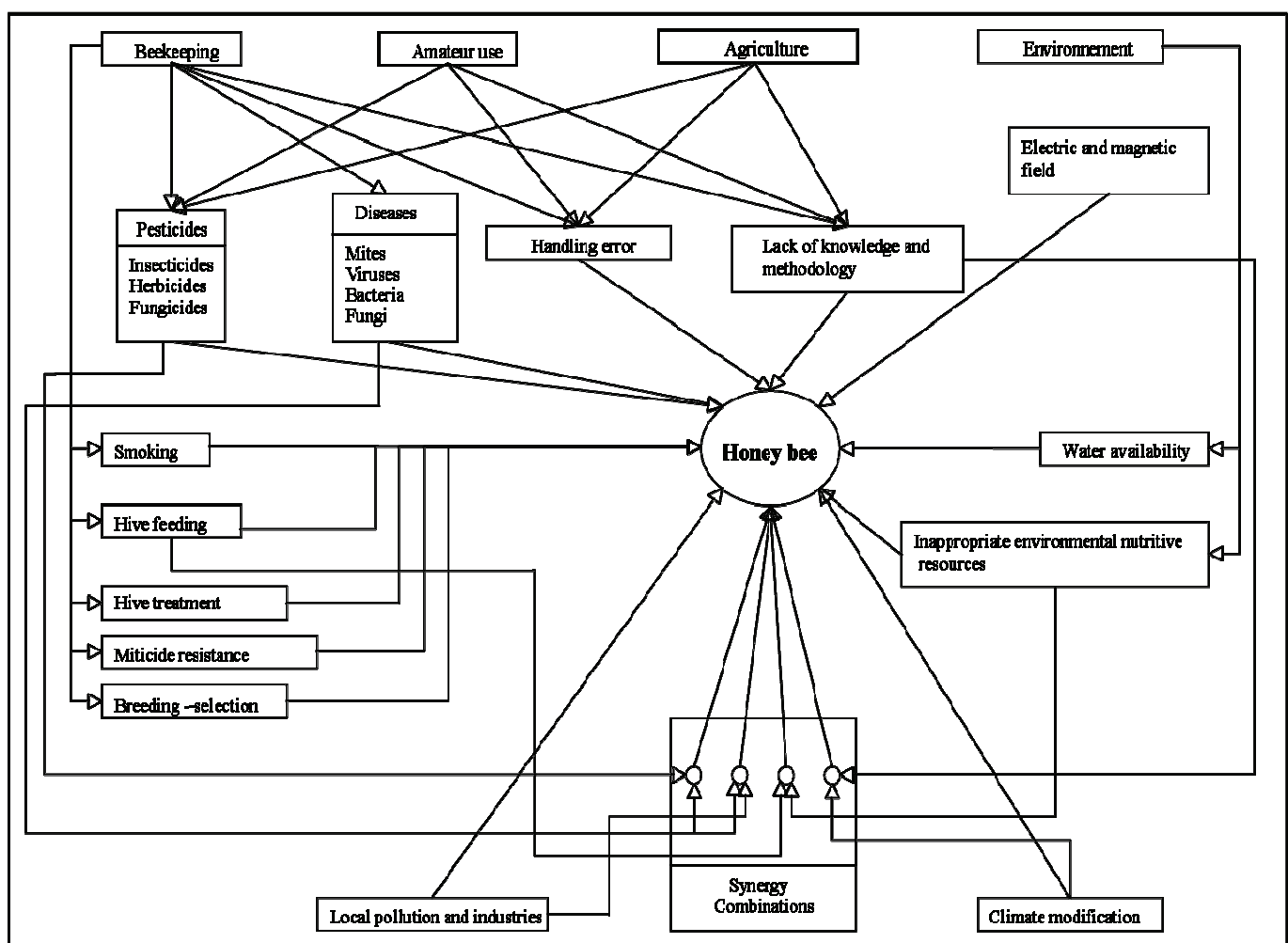


Fig. 1. Factors which could have an impact on honey bee vitality (Haubruge *et al.*, 2006)

the local and national laboratories involved use comparable methods for the diagnosis of bee diseases and pathogens, those methods should be standardised as far as possible. The minimum requirement should be to use the methods of the diagnostic manual of the World Organisation for Animal Health (OIE). A standardised Loss Detection Kit will be developed. It must include tools for meta-genomic surveys. Combined with these kits, three reference laboratories should offer screenings on a broad basis to detect known and new pathogens and environmental stressors.

Bee monitoring Level 4: development of a system for predicting potential honey bee colony losses

Following analysis of the results from Levels 1, 2 and 3 of the monitoring, a system for predicting potential honey bee colony losses could be developed. This development requires an epidemiological and statistical approach to obtain reliable predictions.

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